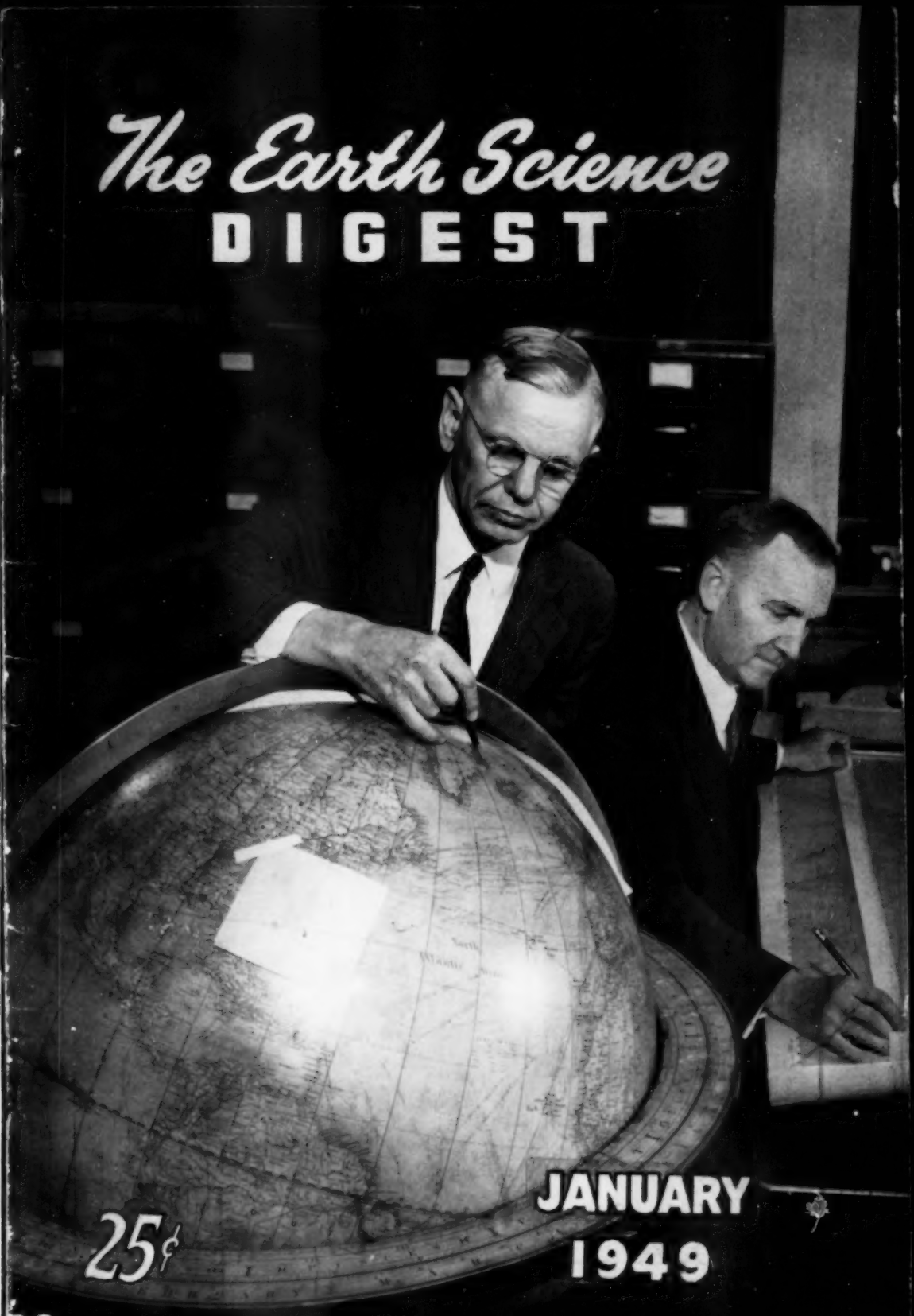
The Earth Science DIGEST



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The Earth Science Digest

Revere, Massachusetts

A magazine devoted to the geological sciences.

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Vol. III JANUARY - 1949 No. 6

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COVER PHOTO

Ralph Bodle and Frank Neumann, U. S. Coast and Geodetic Survey seismologists use data gathered telegraphically to plot the position of an earth quake epicenter on a geographic globe. See "Earthquakes Can't Be Forecast But New Map Shows Probability" —Pages 16-17.

Photo by Science Service.

THE FREEDOM OF SCIENCE

Stressing the democratic belief in the freedom of science, Dr. Vannevar Bush, President of the Carnegie Institution of Washington, in his annual report commented that present division of the world into two groups with vastly different ideologies produces starkly different frameworks of life on the two sides of the iron curtain. The difference, he said, of course extends to the fields of science and scientific research.

"On our side," he declared, "we hold strongly to the freedom of science, for we believe intensely not only that progress in pursuit of knowledge is made rapidly and securely only when any hypothesis whatever may be entertained by individuals, but also that the survival of hypotheses should be determined only by the rigor of test against cold facts and by the consequent mass of scientific support or denial, untrammeled by any arbitrary rulings from above.

"On the other side of the curtain," Dr. Bush continued, "this is not so. In fact, we are told that the philosophy of Mendelism is contrary to the philosophy of Marx and Lenin and must be extirpated, and that those who teach or utileze the genetic laws of inheritance are enemies of the state, to be treated accordingly. It is hard for us to conceive how a body of science in the whole field of biology can be developed under such restraints without becoming ultimately grotesque—a collection of folklore and superstitutions rather than of truth."

In any competition between the two systems, Dr. Bush asserted, it is hard to see any result, even in the applications of science for the national welfare, except an outdistancing of the second by the first, "an outdistancing which will gradually be so apparent to all as to force a revision in any situation where men's minds are still capable of the ordinary processes of human logic."

Commenting on the evolution of scientific research, Dr. Bush said that our world is one in which science and its applications are the dominant factor in life over much of the globe and for the majority of mankind. "It is a world, indeed," he said, "whose greatest current peril grows out of the clash of opposed philosophies of government expressing antagonistic concepts of how to handle a culture made dynamic by the continual swift change imposed by the unceasing expansion of our knowledge of how to control and to exploit our physical environment."

An important measure of the development of research, Dr. Bush pointed out, is the increase in co-operative efforts in which several agencies pool their skill and facilities in attack on a scientific problem. "As we near the halfway point of the twentieth century," he said, "research agencies throughout the country, in fact, throughout most of the civilized world, are engaged in probably the largest range of joint activities in history.

THE GROS VENTRE LANDSLIDE

H. P. ZUIDEMA
University of Michigan

Part Two of a Two-Part Article

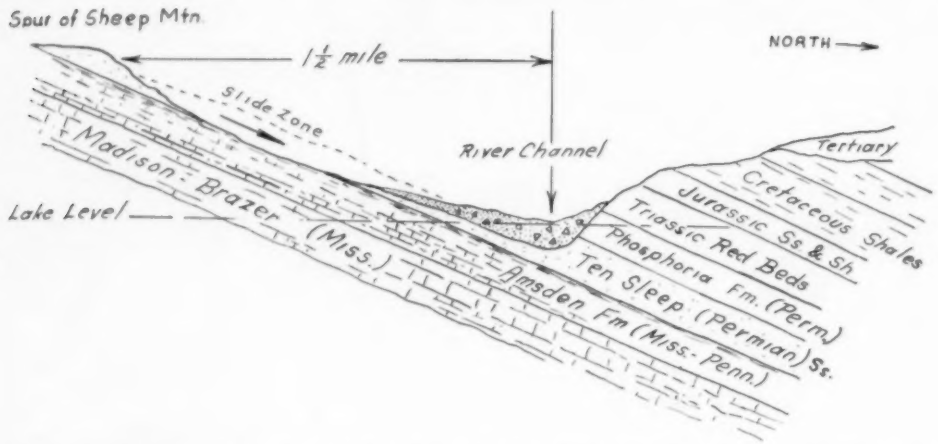
View down the Gros Ventre River, below the slide. Teton Range in the background.
—Photo by H. P. Zuidema

Approximately 50 million cubic yards of rock, carrying with it a dense forest, had avalanched into the valley of the Gros Ventre River, in Wyoming, in less than two minutes, and a large lake called Slide Lake had formed behind this natural dam of broken rock.

The slide occurred on the afternoon of June 23, 1925. Within a few days the ranchers driven from the flooded valley had found temporary lodging elsewhere. Before many months had passed, geologists were on the scene. What had caused the slide? The geologic setting was examined. (See sketch.)

Beds of limestones, sandstones and shales of Late Paleozoic and Mesozoic age in the Gros Ventre area have been tipped up by mountain-building forces in the deep earth so that they now dip toward the valley at an angle of 18 to 21 degrees.

Heavy rains and melting snow during June had saturated the poorly consolidated shales in the Amsden (Mississippian - Pennsylvanian) formation, which lies beneath the Ten Sleep sandstones (Pennsylvanian). The great weight of the overlying rocks overcame the inertia and the



The geologist's explanation of the Gross Ventre Slide. Heavy rains and melting snow saturated the red shales in the Amsden formation, below the Ten Sleep sandstone, causing the upper mass to slip down the slope. The head of the scarp is about 2,200 feet above the old river channel. Dotted zone indicates slide rock which dammed the river.

mass gave way, the underlying shales acting as the slippage plane. The slide moved obliquely down dip.

There was an earthquake four days later, centering in Montana, but there is no evidence that fore-shocks of this quake were felt in northwestern Wyoming. In any event, no tremors which might have served as a trigger action for the slide are on record as having been felt by residents in the Gros Ventre area.

Engineers who examined the dam formed by the slide were of the opinion that it would hold the tremendous accumulation of water behind it. Snowfall was light during the winter of 1925-26, so there was no spring flood and conditions remained practically unchanged. During the following winter, however, heavy snows fell in the Gros Ventre Range.

A keen prediction of the disaster which was soon to come was made about this time by a geologist who had visited the scene. Addressing the Geological Society of Washington, D. C., W. C. Alden [3] remarked that "the great point of interest is what will occur next spring, inasmuch as it seems certain that the dam must be overtopped if there is any such spring flood as occurred in 1918, when the flow at Kelly, four miles below the dam, reached a peak of 6,000 second-feet and averaged 4,000 second-feet for two weeks."

The record also shows that in 1925, soon after the slide, Herman Stabler of the United States Geological Survey, estimated that the cutting of a channel only 25 feet deep in the dam would release about a quarter of the impounded water and that a sudden release would cause a disaster.

Heavy rains and melting snow in May, 1927, caused a rapid rising of the lake and on the morning of May 18 the dam was overtopped.

The first evidence of this was noticed in the town of Kelly when the river began to rise slowly during the morning. By 10 a.m. the river had not yet overflowed its banks, but C. E. Dibble, the Forest Service ranger who had fled

from the upper valley two years before when his ranger station floated away on the newly formed lake, sensed the danger. Dibble made note of the unusual amount of debris in the river, which included a hayrack which he had seen floating on the lake ever since water filled the valley behind the dam.

He and another man got into Dibble's Model T and started up the valley. Half a mile below the dam, the men met the main wall of water.[4] They cut fence wires and released stampeding livestock from pastures, but when they saw a large log house "roll over like a paper box" they sped back toward Kelly. They made one stop, to ask a rancher's wife to send telephone messages down the valley.

At Kelly the townspeople were told they had 15 minutes to get to higher ground, and Dibble hurried to the schoolhouse and instructed teachers to send their pupils home immediately. But some of the residents did not heed the warning.

One rancher laughed at Dibble's warning; the rancher, his wife and their foster son were drowned soon after. An aged couple sat in their car until the first wave overturned it. The man, Frank Almy, was washed into the fork of a cottonwood tree and was later rescued. Mrs. Almy was carried downstream for a mile. She was under water part of the time but finally was washed to a high spot and clung to some sagebrush. A man who had been swept from his wagon while carrying wheat to Kelly was swept near her and came to her aid. A Forest Service supervisor rescued both. Mrs. Almy remarked that she had survived the ordeal without losing either her false teeth or her glasses.

Meanwhile the Gros Ventre bridge at Kelly, a steel structure of 50 tons had been torn from its piers and carried three quarters of a mile downstream.

Mrs. May Lovejoy, a widow, and her sister, Maude Smith, were fleeing in a wagon when the flood struck them. Both lost their lives. A rancher, Max Edick, and his hired man, Clint Stevens, were rescuing pigs and chickens when the flood hit them. Stevens leaped upon a floating hayrack, but his body was found later in a tree, 10 feet above the ground. Edick floated downstream on a chicken house, then caught the branches of a spruce tree into which he climbed. He was rescued by a man who was on a horse which swam through the flood.

First word of the flood reached Jackson about 11 a.m. and at that hour the town of Kelly was no more. Only the church and schoolhouse remained. Some seventy residents were homeless; six were dead. The town of Wilson, downstream, was under six feet of water. Several hours after the flood reached the Hoback postoffice, some fifty miles by river below Kelly, and the postmaster, E. G. Crail, set up camp on a ridge. The effect of the flood was felt as far down the Snake River as Idaho Falls, in Idaho.

Subsequent investigation indicated that seepage through the dam increased rapidly as the lake rose and that the dam was undermined while a channel was being cut at the lowest point by the overflow. The sides of the channel evidently had slumped rapidly and a broad outlet was opened. Nearly 43,000 acre-feet of water in the

upper 50 feet of the lake had passed down the valley. A shore zone marked by dead trees today still indicates the amount of lowering of the lake's surface by the break of 1927.

Again geologists issued a warning, this time pointing out that while the new outlet decreased the danger of future floods, it would seem inadvisable to rebuild the town on the same low terrace at the mouth of the Gros Ventre gorge. This advice was followed, and Kelly today is marked by a small postoffice and store, where visitors occasionally mail cards bearing the postmark of the site of the disastrous flood which came as a consequence of the "Kelly Slide," the local name for the great Gros Ventre slide of 1925.

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1 Floy Tonkin. "Riding the Range," Jackson's Hole Courier, June 12, 1947.

2 W. C. Alden. "Landslide and Flood at Gros Ventre, Wyo." Am. Inst. Min. and Met., Tech. Pub. No. 140, October, 1928.

3 W. C. Alden. "Gros Ventre Slide of June, 1925." Wash. Acad. of Science Jour., vol. 17, no. 5, March 4, 1927.

4 Jackson's Hole Courier, May 19, 1927.

"SHOOTING STAR" PICTURES REVEAL ATMOSPHERE'S DENSITY

MARTHA G. MORROW
Science Service

NEW HAVEN, Conn. Dec.30—Pictures of "shooting stars" have shown that the density of the atmosphere 45 miles or so above the earth increases in summer and decreases in winter. This new discovery was announced to the American Astronomical Society meeting here by Dr. Fred L. Whipple of the Harvard College Observatory.

Meteors are high-velocity projectiles, but unlike V-2 rockets, they begin their flight in outer space and become trapped in our atmosphere, where they boil away high above the earth. The flash of light by which we know of their passing originates high in the atmosphere, in the same area now being reached by rockets.

More information about the densities and temperatures of this area 50-100 miles above the earth, and how they vary with the seasons, is thus vitally needed if we are to make maximum use of this "proving ground" for rockets and other high-velocity projectiles.

Density of the upper atmosphere is lowest in the northern hemisphere in late January and highest in early August, Dr. Whipple found. Thus, it is correlated with the average ground temperature, and changes with the seasons rather than with the sun.

Local variations of temperature have little or no effect on the atmosphere's desity at this height, his studies indicated. Nor are storm fronts responsible for changes in density, as previously thought.

This Harvard photographic study of meteors, which has produced definite results after only a few months of observing, is sponsored by the Bureau of Ordnance of the Department of the Navy. The first photographs last August were taken simultaneously from two mobile caravans located just north of the Mexican border and near the city of Las Cruces, N. Mex. This is the first mobile photographic observatory to be used to study meteors.

These meteor photographs are also expected to provide new information about the nature and role of the ionosphere, upper layer of the earth's atmosphere which bounces radio waves back to the earth and enables us to hear distant radio signals, about weather variations and the climate of the world.

Separate stations and the use of two cameras make it possible to measure the height of meteor trails within a few feet and chart their paths more accurately. For this, scientists can determine the density of the atmosphere 50 to 75 miles up.

The assembling and most of the construction of the new type observatories was done by two young veterans, Harlan J. Smith and Richard E. McCrosky. They were assisted on the photographic work by Phillip Carroll, Jr.

THE WILD WELL AT LEDUC

HORACE G. RICHARDS
Academy of Natural Sciences of Philadelphia

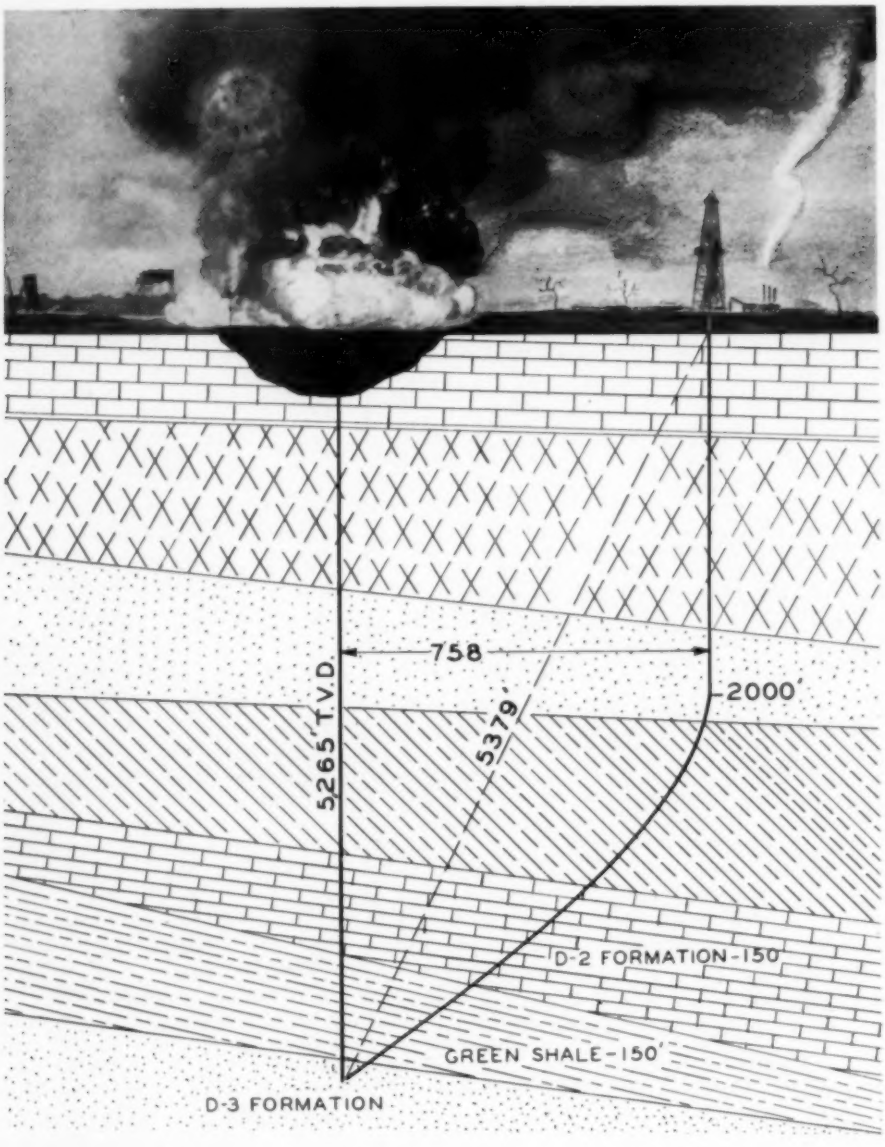
The wild well at Leduc. Atlantic 3, September 7, 1948.
— Photo by Horace G. Richards

One of the most important oil fields recently discovered is in Canada, at Leduc, about 16 miles southwest of Edmonton, Alberta. Expectations have been high that this field would surpass in importance the Turner Valley Field near Calgary, and thus prove to be Canada's most important source of oil. The field was discovered early in 1947, largely through the activity of Imperial Oil Limited. Oil is produced from two zones of Devonian age, known as the D-2 and D-3 formations, the deeper zone (D-3) occuring between depths of 5100 and 5300 feet.

While Imperial Limited was responsible for much of the development of the field, various independent companies also drilled and in many cases obtained producing wells. One of these independents was Atlantic Oil Limited, which prior to March, 1948, had already drilled two successful wells. Their third well (Atlantic 3) was already giving promise of being another producer when on March 8, 1948, it blew out, bringing great quantities of oil to the surface. The well was kept partially under control until May 8, when it went completely wild, blowing oil and gas to the surface through the drill pipe and numerous seepages scattered within half a mile of the well.

Consequently great quantities of oil collected in pools on the surface of the land near the well. To prevent fire, this oil was drawn off as rapidly as possible, and kept in temporary reservoirs until it could be taken away from the field by rail or pipeline. Also, thousands of barrels were returned to the ground through Atlantic 1 and 2 wells until facilities were available to transport the oil away from Leduc. By July 1, 1948, 7834 barrels of oil per day were being removed from Atlantic 3 well and its lakes; in addition, some 4000 barrels were returned to the ground each day through the other wells.

Meantime, every effort had been made to check this wild well. As early as May 14, the Conservation Board of Alberta took over the well and supervised the removal of the oil and the efforts to bring the well under control. Various materials were thrown down the well in an attempt to check the flow. These materials included cement, mud, sawdust and chicken feathers; none had any effect. Two



Artist's conception of Atlantic 3 after catching fire, with schematic diagram showing projected path of directional well drilled from the West. Water injected under pressure through West Relief soon established channels between the two wells to permit loading the wild well with water. Weight of the hydrostatic head of fluid soon nulified the pressure and killed the well. Diagram not according to scale. (From World Oil, October, 1948).

— Courtesy of World Oil

relief wells were started on the west and south side of Atlantic 3. By means of directional drilling, that is drilling at an angle, it was hoped to reach the bottom of the wild well, and to flood it to relieve the pressure. This directional drilling was under the supervision of

the Eastman Survey Company, and slow but steady progress was made throughout the summer.

The writer was returning from a geological expedition to Arctic Canada in early September, and was planning to pay a visit to the Leduc Field, mainly to see the wild well. As our plane approached Edmonton on the morning of September 7, we noted great clouds of smoke in the sky south of the city. We did not realize the significance of this until we telephoned the Imperial representative in Edmonton to arrange transportation to the oil field. We were then informed that Atlantic 3 was on fire and that it would be impossible to reach Leduc because the roads were jammed or blocked. This did not deter us, and we then called the bus line and were told that a bus was to leave for Leduc within an hour. We arrived safely and were taken on a quick tour of the field by Mr. R. D. Sluzar of the staff of Imperial Oil Limited.

It seems that the wild well had been becoming more active during the preceeding week, and only a day or two before the derrick had begun to topple over. Finally, the derrick had fallen to the ground, and in so doing, probably a spark had been created. At any rate, late in the afternoon of September 6, the well and the nearby pools of oil had burst into flames. Great quantities of smoke and flame were being thrust upwards hundreds of feet into the sky.

Fortunately, the unusual activity of the wild well had been sufficient warning to keep people away from the toppling derrick, and consequently no one was injured by the fire. Every effort was made to keep the fire within bounds and to prevent it spreading throughout the field.

By a fortunate coincidence, on this same day one of the relief wells reached the D-3 formation. So, almost immediately great quantities of acid and water, under pressure, were poured down the relief well to the danger zone in the D-3 formation. Almost 33,000 barrels of water per day were used in an attempt to check the fire.

These measures had their effect. By 6:00 A.M. on September 9, the fire was out and the wild well was under control. We read this encouraging news when we reached Toronto on the morning of the 10th.

Attempts were made to pour mud and cement down the two relief wells in order to permanently keep Atlantic 3 under control. As this note goes to press we are informed in a letter from Mr. Sluzar that "the well has been brought permanently under control and that drilling and production have returned to a normal state with the removal of government restrictions which were put into effect during the blow-out. Production has also been resumed from the other two wells on the same lease."

A great deal of oil was lost in this fire. Estimates reached as $50,000 worth per day. On the other hand, very little of the oil blown out by the wild well prior to September 6 was lost. In fact the gross sales to the end of June amounted to $1,328,000. While it would have been preferable to obtain the oil less rapidly and under more conroled conditions, it was exceedingly fortunate that so little of the blown-out and cratering oil was lost.

Further drilling and exploration is being carried on and the future of the Leduc oil field is exceedingly bright.

The Earth Sciences — 1948

by Science Service

WIDELY SEPARATED TREE COUSINS ONCE LIVED VERY CLOSE TOGETHER

BERKELEY, Calif., Nov. 19 — Four related kinds of trees that are now widely scattered strangers, though all of them are members of the same plant family, grew as near neighbors a few tens of millions of years ago, Dr. Ralph W. Chaney of the University of California told the National Academy of Sciences meeting here.

The trees in question are the bald cypress of our southeastern states, the sequoias of California, the China cypress or glytostrobus of southern China, and the recently discovered "dawn redwood" of interior China. The two Chinese genera are now the nearest neighbors, and even they are separated by hundreds of miles.

Yet in Miocene geologic time, some 20,000,000 years ago, all four genera grew in a limited area in interior Oregon. They had got there from their points of origin in Alaska and elsewhere in the Far North, taking about 20,000,000 years for the trip. Now their fossil remains are all found together within a 60-mile distance, in a geologist's paradise known as the John Day Basin.

Though their fossils are found in this basin, the trees themselves have long disappeared from it, and their present widely separated habitats differ sharply from each other in both topography and climate.

PUNCH A HOLE IN THE OCEAN BOTTOM, IF YOU WANT TO GET EARTH'S HISTORY

BERKELEY, Calif., Nov. 20 — Go to the bottom of the sea. Punch a hole 100 feet deep. You can then bring up to the surface a core of rock and mud that will record the whole long history of the earth, 2,000,000,000 years or so of geologic time.

Dr. Maurice Ewing, Columbia University geologist and oceanographer, who has this summer probed the floor of the Atlantic, told the National Academy of Sciences meeting here that this is a possibility.

The longest core yet captured by Dr. Ewing is 37 feet from the floor of the Atlantic, but Swedish scientists have one that is 60 feet long. Dr. Ewing predicted that a 100-foot sample, less than formerly believed to represent the sediments since the beginning of earthly time, can be obtained in the near future. Microscopic fossils in the earth cores give valuable new clues to our picture of the earth.

Dr Ewing also states that the depth of granite bedrock, lying under the ocean mud, can be determined by the explosion of depth charges under th surface. The refraction, or echo, that follows the explosion can be used to determine the depth and nature of the bedrock. Such measurements, in the mid-Atlantic, have shown a granite layer 40,000 feet thick, under which lies basalt rock.

EARLY STONE AGE TOOLS HELP CHART OCEAN CHANGES IN AFRICA

NAIROBI (Kenya, Africa) Nov. 22 – Early Stone Age Tools, used by prehistoric man, have been found at the former sites of beaches in Mozambique, Portugese East Africa, indicating that the ocean may have receded 40 or 50 miles and dropped its level by 150 feet since Stone Age man first inhabited the continent.

Discovery of this geographical change was made recently by a group of University of California African Expedition scientists, including Prof. Gelal Awad of Farouk University, Alexandria, Egypt, and Dr. H. B. S. Cooke, South African geologist. The group was invited to Mozambique by the Portugese government.

Expedition scientists, under the direction of Wendell Phillips, also found a number of new types of fossil marine shells, some of them laid down on the beds of dried-up seas for as long as 80,000,000 years.

Importance of the discovery of sea-level changes in the area is that it will yield valuable geographical information for future studies of the relation between man and his physical environment on this part of the continent.

SHARK SPINES ADD 100,000,00 YEARS TO ESTIMATED AGE OF SOUTH AMERICAN ROCKS

CINCINNATI, Nov. 25—Ancient shark spines, discovered in South America by a University of Cincinnati scientist, have set back the age of some rock formations by 100,000,000 years.

Dr. Kenneth E. Caster, paleontologist, just returned from an exchange professorship at Sao Paulo, Brazil, explained that the shark spines and associated fossils were the first of their type ever to be found in Devonian rocks of the Paleozoic age. Rock formations thought to be 200,000,000 to 250,000,000 years old are now believed to be 350,000,000 to 400,000,000 years old, because of the new discoveries.

First fossils of giant sea scorpions ever found in the southern hemisphere were also identified by Dr. Caster. The scorpion remains occur in great abundance in the Brazilian state, Piaui, but they had been previously identified as plant fossils, the scientist said.

SINK-FLOAT PROCESS SEPARATES MINERALS

NEW YORK, Dec. 2 — Sink-float processes, highly efficient in separating coarsely crushed solids on the basis of specific gravity differences, have developed rapidly during the past few years and today are treating millions of tons of ores and coal each year, the American Society of Mechanical Engineers was told here today by John T. Sherman of the American Cynamid Company. These processes use heavy-density liquids and mixtures. Development of new liquids was described.

Because of low capital cost and cost operation, sink-float plants can be used to grade up sub-marginal ores to a point where they can be treated profitably, Mr. Sherman said. Waste dumps and talings from less efficient concentration methods can be treated. In effect large new reserves of mineral resources are being created.

FOSSILS OF GIANT APE-MAN DISCOVERED IN SOUTH AFRICA

BERKELEY, Dec. 3—Giants as well as pygmies were among the weird population of ape-men who prowled South Africa's veldt in the dim geologic age before the emergence of man himself. Evidence for the existence there of a huge near-human being that was twice the size of a modern gorilla but much more man-like was reported to the University of California here from one of the field parties of its African Expedition, by Dr. Robert Broom of the Transvaal Museum, who joined the University of California group last September.

Dr. Broom's find consists of the greater part of a lower jawbone containing three premolars and four molars, together with a separate lower wisdom-tooth, two upper incisors and one upper eye-tooth. All the teeth are gigantic, slightly larger than those of the giant Java man, Meganthropus. A man proportioned to match the dimensions of these teeth would have to be two and one-half times as big as an average human being and at least double the size of a present-day gorilla. Yet the teeth are definitely human in shape, not gorilline. In this they resemble the giant teeth from Asia.

Discovery of this race of giant ape-men comes on the heels of Dr. Broom's announcement, a few days ago, that fossil remains of the creatures named Plesianthropus represented a race of small, gracefully built ape-men weighing about a hundred pounds apiece, who knew the use of fire and of weapons and were in general much more human than they were first credited with being.

The new giant race will be known as Swartkrans Man, from the name of the cave where the jawbone and teeth were found. Age of the fossils is at present uncertain; estimates run from one-half million to four million years. Much further work by geologists will be necessary to obtain a really accurate estimate.

Dr. Broom radioed to Wendell Phillips, leader of the University of California African Expedition who is now in Berkeley to report on the expedition's first 14 months of field operations: "On evidence to date, we can say that the new-type ape-man is larger than those previously known, that these ape-men are like man and were probably ancestral to him, and that they are not closely related to living apes."

AMERICAN AND BRITISH ATOLL BORINGS TO BE COMPARED

WASHINGTON, Dec. 4 — How old is an atoll?

This still-vexed question may be brought closer to solution at the U.S National Museum through the arrival here of two tons of rock from the British Museum. The rock consists of cores cut by a hollow drill that bit 1,100 feet down into the substructure of the British-held atoll of Funafuti, a half-century ago. These cores will be compared with similar cuttings made since the war at Bikini atoll.

As of now, there seems to be a wide discrepancy between the ages of the two sets or rock samples. The Funafuti cores were estimated to be not more than 25,000 years old when they were first examined; those from Bikini have been assigned an age somewhere between 10,000,000 and 15,000,000 years. A re-examination of the British material may indicate that the first estimate on its age was too low. However, there seems to be considerable difference between the mineralogical makeup of the rock samples from the two atolls, which lie 1,500 miles apart in the Pacific.

Negotiations for the loan from the British Museum were conducted by Dr. John W. Welles, Cornell University geologist.

AMERICA FACES CHALLENGE TO LIVE WITHIN OWN NATURAL-RESOURCES MEANS

NEW YORK, Dec. 7 — America faces a challenge to live within its means, in in terms of utilization of its natural resources, declared Fairfield Osborn, president of the New York Zoological Society and author of the best-selling conservation book, Our Plundered Planet, before the Cooper Union Forum here this evening.

We have not been doing so, but instead have been eating up our national capital, the speaker asserted: "Our famed high standard of living has been built to a considerable degree upon consuming our reserves. One wonders why we Americans cling to the illusion — the pap of seekers for political office — that our standard of living is always going up."

There is no use in looking to the tropics for a new frontier, either, Mr. Osborn told his audience. In the rainy region south of the Sahara in Africa soil erosion is already a recognized and severe problem. The Amazon basin is a thickly forested wilderness; but it is unsafe to clear it because as soon as the forest cover is removed the diluvial rainfall of the region begins to waste the land.

We must therefore learn to live mainly on our own resources, and to take care of those resources so that they will continue to serve the nation indefinitely. At present, the good, productive land in the United States averages about 3.5 acres per inhabitant. Curiously enough, citizens of the USSR have almost exactly the same number of acres to support each person in that country. It remains to be seen which of the two socio-political systems will prove best in terms of intelligent land use.

CHEAPER FUEL OILS FROM COAL PROMISED BY NEW PROCESSES

PITTSBURGH, Dec. 15 — Cheaper gasoline and fuel oil from coal is promised by improved processes under development at the U. S. Bureau of Mines experimental and research laboratories in Bruceton, near here.

In these laboratories, a basically new approach to the problem of synthetic liquid fuel production by direct hydrogenation of coal is under investigation by Dr. Henry H. Storch, chief of research at the institution. The method he said, is a departure from the conventional Bergius process used by the Germans.

In this German process, coal dust is mixed with oil to form a paste. This is then treated with hot hydrogen under a pressure of more than 2,000 pounds per square inch. In the new process, Bureau chemists are trying to achieve better results by using moderate pressures and relatively high temperatures. Under these conditions considerable coal is turned to coke, but the coke can be recovered and used to furnish heat for the process.

In the new developments, relatively inexpensive water gas may replace the expensive hydrogen. The cost of compressed hydrogen constitutes about 50% of the total cost of liquid fuels prepared by hydrogenation of coal, he stated. Water gas, made by passing steam over white-hot coke, is the common manufactured gas used in many cities where natural gas is not available.

Laboratory experiments have disclosed that under appropriate operating conditions it is possible to replace pure hydrogen with the water gas, which is itself a mixture of hydrogen and carbon monoxide. Similarly, it is also possible to substitute for pure hydrogen the light, gaseous by-products of the

hydrogenation process. Coal itself contains some available hydrogen which can be exploited by converting the coal to coke.

An entirely different process is also under study. In this the coal is dissolved before being treated with hydrogen. Research is now directed at determining the best solvent, and also at discovering suitable catalysts to speed the hydrogenation action under these conditions. This process is carried out at relatively low temperatures and pressures.

PLENTY OF URANIUM FOR ATOMIC AGE: COMMISSION LISTS KNOWN DEPOSITS

DENVER ,Dec. 17. There's plenty of uranium in the world for the atomic age, chairman David E. Lilienthal of the U. S. Atomic Energy Commission declared here.

The big raw material problems, being pressed by the Commission, are where it is and how to get it, Mr. Lilienthal said.

Here is where uranium (believed to form some four ten-thousandths of the earth's crust) is known to be, thus far:

1. High-grade deposits of pitchblende-radium. Three of these deposits are known, two outside the Iron Curtain and one inside. Russia is exploiting deposits in the Erzgebirge district of Czecholsovakia and Germany, while the U. S. gets uranium from both Eldorado in Canada and the Shinkolobwe deposits in the Belgian Congo.

2. Colorado plateau ores of vanadium-uranium. Known as carnotite and roscoelite, these ores are chiefly important in this country— and are "quite inferior" to the high-grade ores.

3. Gold-uranium ores of South Africa. Discovery of uranium as a by-product of gold mining in South Africa has set American scientist to systematically searching all mine and smelter products in the U. S. for possible by-product uranium.

4. Oil shales which bear uranium may supply millions of tons of uranium ore, Swedish reports indicate. The uranium-bearing oil shale which the Swedes are investigating is known to extend into Russia. In the U. S., the AEC is studying all possible oil shale-uranium deposits.

5. Miscellaneous types of mineral deposits which have been found to contain small amounts of uranium.

Uranium prospecting, Mr. Lilienthal indicated, may be more profitable than the traditional search for gold. The Commission is paying off on discoveries of new deposits. And estimates are that uranium may be a thousand times more plentiful than gold on the earth.

URANIUM IN NORWEGIAN FJORD MUDS; BUT NOT ENOUGH OF IT TO PAY

OSLO, Norway, Dec. 20 — Uranium-containing black mud can be dredged up from the bottoms of some of the fjords that cut deeply into the coast of Norway, states Dr. Kaare M. Strom of the University of Oslo in a communication to the editor of the British scientific journal, Nature.

The atomic-energy element, however, is not present in high enough concentration to justify scooping out the mud and working it as an ore. It is of interest primarily as a possible means of determining under what geologic conditions the uranium-containing black shales now found in the Norway hills may have been formed, perhaps half a billion years ago.

Uranium concentrations in present-day fjord-bottom muds range from 13 to 50 grams per metric ton, Dr. Strom's analyses show. This is roughly equivalent to a range of from one-half ounce to two ounces per English long ton of 2,240 pounds. This is far below present levels for workable uranium ores; the U. S. Atomic Energy Commission will purchase such ores only when they contain more than two pounds of uranium oxide per ton.

As having possible bearing on the question of the origin of uranium-containing shales, Dr. Strom points out that the highest concentrations are in the blackest of the fjord-bottom muds, which come from situations where little ozygen penetrates and where only bacteria of the anerobic, or "airless" type can thrive. Well-ventilated muds, inhabited by air-using bacteria, are lighter in color and lower in uranium content.

1948 Research Activities in Geology Reported by the Carnegie Institution

The following reports from the Departments and Divisions of the Carnegie Institution of Washington are reprinted from the Report of the President of the Carnegie Institution of Washington for the year ending September 30, 1948:

The Geophysical Laboratory

Some results of marked significance have emerged from the Geophysical Laboratory's investigation of silicates in the presence of water under pressure. New observations by Dr. Morey and his group on the behavior of aqueous mixtures have demonstrated that the solution of solids in vapor may take place in notable amounts. Water vapor at a temperature of 400° C. and under a pressure of 1000 atmospheres, for example, has been shown to dissolve 7/100 of a gram of sodium disilicate per cubic centimeter. It is now very clear that a gas that is under a high pressure and, therefore, has an appreciably density resembles a liquid rather than a typical gas in respect to its ability to dissolve solids. The solution of solids in gases or vapors is of physical-chemical interest and may represent an important step in some types of mineral deposition.

In another line of experimentation, Dr. Bowen and Dr. Tuttle have obtained detailed information on the conditions under which a series of minerals consisting of hydrated magnesium silicates are formed. For example, the mineral serpentine, which in its fibrous form is one variety of asbestos, can now be readily produced in the presence of water under pressure. It has been shown to have an upper limit of stability of approximately 500° C., higher temperatures causing the serpentine to decompose into forsterite and talc. This limiting temperature of the stable existence of serpentine may turn out to provide one of the most useful of "geologic thermometers" for fixing the temperature of processes that have occurred in certain rocks of the earth's crust.

The Department of Terrestrial Magnetism

The Department of Terrestrial Magnetism has been considering two tentative hypotheses on the origin of the earth's main magnetic field. One of these is the so-called "fundamental" theory, recently discussed by Blackett, which assumes that the magnetic field is due to a fundamental property of matter, and is hence associated with the size, mass, and rotation of the earth. On the basis of this idea, a significant portion of the field should remain without sensible change for hundreds of millions of years. According to another theory the field results from a set of complex phenomena inside the earth's central core, based on known electromagnetic laws. Such a theory might permit large changes and even reversals of the earth's field during millions of years. A critical test of these different explanations might be possible if measurements extending over a sufficiently long period of time were available.

Direct measurements of the direction and intensity of the earth's field date back only a few hundred years. This period is, of course, extremely short by geological standards. The measurements do

show, however, that rapid changes are taking place; an apparent decrease of the order of 4 per cent per century in the intensity of the field has been indicated by measurements over large areas of the earth's surface.

The Department's measurements of the magnetization of waves and ocean-bottom samples, carried out by Dr. Johnson, Mr. Torreson, and their colleagues, show that large rates of change can persist only for relatively short epochs. In fact, the current interpretation of these measurements would indicate that the earth's field has been behaving and changing throughout the past million years in much the same way as we now observe, with only modest changes in magnitude and direction. This result is compatible with either the fundamental or the core theory, or both. Efforts are hence being made to extend the measurements, although somewhat roughly, back half a billion years by examination of samples of sedimentary rocks. Meanwhile, the fluctuations in the field noted during shorter intervals of time, after careful checking, should provide useful new basic data for constructing and testing an adequate theory of magnetic secular change, such as, for instance, a dynamo theory based on internal circulation of material and heat within the earth's central and supposedly fluid core.

Division of Plant Biology

Dr. Chaney's visit to China to examine the recently discovered *Metasequoia*, a living relative of the redwood, which previously was known only as a fossil, established that it is now growing in association with the plants which have been found with it in the fossil state. The continuation in China of the climate which in the Tertiary age was widespread in North America has made possible the survival of this unit of vegetation over a period of scores of millions of years. The fossil floras of the northern hemisphere are today found as a flourishing forest in the sheltered interior of Asia. It is perhaps the most notable case of group continuity through time which is known anywhere in the world. Many of the Tertiary fossils so widespread in the northern hemisphere which had been assigned to *Sequoia* now prove in reality to be *Metasequoia.*

Radioactive Gas May Be Geologic "Clock"

Science Service

A potential "clock" for the measurement of geologic time may be furnished by the decay of a rare radioactive kind of element argon. Argon is the gas sometimes used in incandescent lamps.

Radioactive potassium changes to argon by a type of atomic decay which, explain Drs. L. T. Aldrich and Alfred O. Nier, University of Minnesota physicists, is relatively unaffected by outside conditions. The age of geologic periods might be estimated by determining the percentage of radioactive potassium that has been changed to argon in a given potassium sample. Value of such a method of estimating prehistoric time would be immense, as radioactivity is the only clock that has recorded since the beginning of the earth.

The scientists emphasize that their methods are still not exact, and cannot yet be used for accurate geologic measurements. They feel that improved techniques and careful measurements can eventually make the potassium "clock" an invaluable tool for researches in the earth's history.

EARTHQUAKES CAN'
BUT NEW MAP SHO

FRANK TH

Frank Neumann of the U. S. Coast and Geodetic Survey has prepared what might be called a map of earthquake chances. More formally, it is styled a seismic probability map, which means about the same thing.

Most definitely, it does not undertake to forecast earthquakes for any given time. That simply cannot be done, on the basis of such knowledge as we have at present. What Mr. Neumann's map does show is where heavy earthquake damage has occurred in the past, and where there has been light damage or none at all. On the assumption that where earthquakes have occurred several times they may occur again, you can estimate your own long-range chances.

The map shows two large regions in this country where there has never been any major earthquake damage. These are the Gulf coastal plain, including about two-thirds of Texas, and a northern area that takes in most of the Great Plains and the states of Minnesota, Wisconsin and Iowa.

The largest area where there has been repeated and heavy earthquake damage covers the greater part of California, plus the western half of Nevada. A less extensive but nevertheless important area includes the western and northwestern parts of New York state, and continues into lower Canada as a narrow strip along the course of the St. Lawrence river. The rest of the country is indicated as areas of light to moderate damage.

Within this "safe" region, however, are three isolated spots where heavy earthquake damage is indicated: one in western Montana, one on the coast of South Carolina, and the third near the confluence of the Ohio and Mississippi rivers. Each of these marks the spot

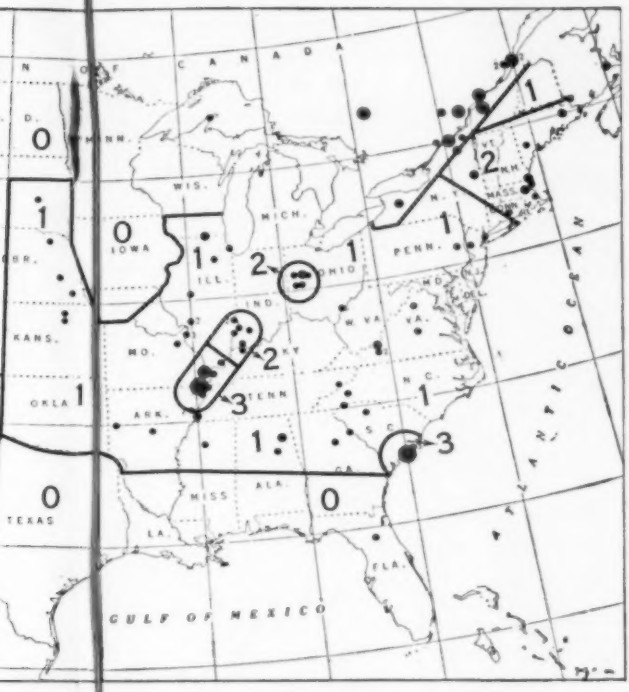
U. S. Coast and Geodetic Survey map shows loca and regions graded, 0 to 3, according to estimate

where a severe shakeup took place; the Helena earthquake of 1935, the Charleston wrecker of 1886, and the terrific triple shocks that wrenched the New Madrid, Mo., area in the winter of 1811–12. This latter was one of the most violent earthquakes in human history; it changed the course of the Mississippi overnight and created several new lakes. Fortunately, the region was almost uninhabited at the time.

This occurrence of really severe isolated earthquakes in regions with otherwise uneventful seismic histories gives special point to the warning of Mr. Neumann, that "no area can be guaranteed to be im-

CAN'T BE FORECAST SHOWS PROBABILITY

RANK THONE



p shows location of big and little earthquakes (black dots) to estimated probabilities of future damaging shocks. —Photo by Science Service

mune from either moderate or destructive earthquakes."

Hunting Earthquakes

Hunting earthquakes as they occur is a fascinating game, involving a combination of news-gathering and scientific methods. Participants are scattered all over the country, indeed all over the earth; their moves are flashed by radio and wire to the coordinating centers where interpretations are made and results determined.

When an earthquake occurs, the waves it sets up in the rocky material of the earth spread out like ripples from a stone thrown in a pond. Even though they become imperceptible to human senses, they are still able to move the delicately balanced instruments called seismographs, leaving wiggly lines on photographic or smoked paper to record their passing.

Scientists skilled in these matters know how fast such waves travel through or around the earth, so from the time-marks on the records they can tell how long it took for them to arrive, hence how far away the point of disturbance was. That is all you can tell from the readings at one observatory—distance only, and a general idea of the direction. It takes data from several stations to pin-point the exact location of the quake's disturbance, technically known as its epicenter.

Coded Data

For this reason, Science Service has for many years had arrangements with seismological observatories all over North America and the Pacific area, to rush coded data to Washington by radio and wire as soon as the records can be read. These data are relayed to seismologists of the U. S. Coast and Geodetic Survey in Washington, D. C., and to the Jesuit Seismological Association's headquarters in St. Louis.

These scientists lay off, on a large globe, lines representing the distances reported by the various observatories. If three or more of these lines intersect at a point, that is the epicenter. If, as often happens, they do not exactly intersect but outline instead a small triangle, the epicenter is somewhere inside it. More lines are drawn, cutting down the size of the triangle, until a close approximation of the epicenter is arrived at. This at once becomes news for the public, as well as information for the scientific world. (See cover photo.)

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Gems From The Sky

SIEGFRIED VON GLISZCZYNSKI
Muenster University, Gottingen

Translation by Wolfgang V. Swarzenski
Boston University

Are there really gems which fall from the skies? Generally, these messengers from outer space are only iron or rock meteorites, or bodies composed of both materials; the latter are called pallasites. However, it might be possible that these cosmic bodies contain minerals of gem character. Let us examine those minerals closely.

The queen of all gems, the diamond, is indeed found occasionally in meteorites, although certain doubts concerning this statement existed until very recently. However, the diamonds found were so small and insignificant that their use in jewelry was out of question. The same is true for the mineral diopside, a variety of pyroxene, occasionally encountered in the gem trade: when it originates in meteorites, it cannot be cut, because of its small size and insignificant appearance.

Different, however, is the case of olivine which is found frequently under the names of peridot and Chrysolite. Already in ancient Egypt olivine was cut for jewelry. It is not at all impossible for olivine to occur in meteorites, and particularly in pallasites, in specimens good and large enough to warrant cutting into gems. However, this has not been the case so far. Thus our list of "gems" from meteorites would come to a close. Gems treated in this article are of a totally different character. They are, physio-chemically, glasses whose cosmic nature was recognized only recently. Pieces of glass, green, yellow-green or green-brown in color, were found early in Bohemia, in the deposits of unconsolidated material and gravel of late tertiary and diluvial rigin; nobody quite knew what to do with them, until they were classified as meteorites. These bodies of glass were named tectites by F. E. Suess in 1910. The size of tectites varies, from that of a minute fragment to that of a fist; the latter is quite rare, though.

The surface appearance of tectites varies greatly. The surface of Bohemian tectites, also called moldavites, resembles rather closely a dried prune; the glass body is covered with a multitude of furrows and grooves. There is a large variety of external forms; spherical bodies, however, are rare. Tectites from Indo-China and the island of Billiton occur frequently in the shape of a pear, droplet, or dumb-bells. Australian tectities are predominantly of the button-shaped type.

The tectites have all the characteristics of glasses: banding and air bubbles occur in great numbers. The specific gravity of the Bohemian tectites is quite constant. It is given by E. Preuss as 2.35 + 0.05. The refraction of light in moldavites is close to 1.49. This fact already would indicate that tectites are not artifacts of early times, but rather bodies of cosmic origin.

Non-Bohemian tectites — those from Indo-China, the island of Billiton, and Australia — have a

somewhat higher index of refraction: n = 1.51 to 1.52. Their specific gravity is also somewhat higher than that of the Bohemian tectites, varying between 2.43 and 2.50. Futhermore, there is a direct relationship between the index of refraction and specific gravity of all tectites, including those from Bohemia. For cosmic bodies, tectites are extraordinarily rich in silica. Besides the presence of silicon, sodium and potassium, Preuss found by spectrographic examination the metals iron, chromium, nickel, manganese, and titanium, furthermore, in small amounts, beryllium, boron, and strontium, as well as some others. Australites and billitonites, named for their geographic occurrence, have a higher iron content than moldavites and have consequently a deeper green color. The opposite is true for their potassium content: moldavites contain approximately twice as much potassium as the other tectites.

Chemical analyses reveal a great similarity which is the reason for the doubt of their cosmic origin. Indeed, there are many "tectites" which, however, always exist in conjunction with true meteorite craters. Their origin is due, therefore, to the impact of meteorites, with the ensuing formation of glass on sandy soil. The tectites moldavite, billitonite and australite seem to have no relation to these meteorite craters, a fact which would advocate their cosmic origin.

It is interesting to note that nearly all tectites bearing specific names were found on a wide arc across the surface of the earth. A dispersement over approximately 10° is to be regarded as rather small. This wide arc begins in Bohemia, croses France, the northwestern corner of Spain, the Atlantic Ocean, and reach South America in Venezuela. It crosses the equator at the border between Colombia and Brazil, continues through Ecuador and Peru, and then across the Pacific Ocean to New Zealand and Tasmania. The arc continues through southern Australia, the islands of Timor, Billiton and Borneo, the Malay peninsula, Indo-China, the Ganges delta, Nepal, northern Afghanistan, across the Caspian Sea, north of the Black Sea, to reach Bohemia again.

To base these facts on the cosmic origin of tectites, one would have to reckon here with a multitude of meteorites whose "glassy" nature were unique, because of certain melting processes. To strengthen this theory, it would be necessary to discover further examples along this wide arc. The strongest objection regarding the homogeneity of all these tectites lies in their chemically not quite harmonious nature: as stated already, moldavites contain less iron, but more potassium, than billitonites and australites.

The first moldavites were found in Trebitsch and Budweis, in Bohemia. They were already cut occasionally in the last century, greatly esteemed by connoisseurs and amateurs, and even worn by a few people. In fomer times, these stones were known in the gem trade as "Bouteillensteine", or bottle stones, because of their bottle-green color.

Recently, we find renewed interest in these gems from the skies. Specimens of real gem quality, i.e. pieces of uniform green color, lighter or darker shades to suit the prevailing taste, without disturbing banding or air bubbles, occur by no means frequently. As the moldavites and all other tectites have a hardness of approximately 6 (Mohs scale), they are

not quite considered true gems; this, however, is unjust, as many naturally occurring gems are of a considerably lower degree of hardness. Only their traditional names make them more readily acceptable to the general public.

The price of moldavite (the gemologist does not distinguish other varieties) is determined by weight, generally in grams, sometimes in carats; it varies according to location and buyer. It is impossible to quote a valid price for moldavites today, since only collectors' items are involved which have no bearing on a mass market.

There are also glass imitations, under the name of moldavites, which are quite readily distinguished from real moldavites by the gemologist, because of their different optical properties and specific gravity. The author saw at a gem dealer's in Idar a large lot of cut glass moldavite, next to a true tectite. As said previously, in tectites the specific gravity bears a direct relationship to its index of refraction. It is not impossible to produce synthetic glass of this kind which would be practically undistinguishable. It seems that up to the present day no such imitations were made on a large scale because of the small demand. Only he who desires to buy a not too commonplace stone, not wanting to spend much money, would be glad to acquire such a stone, fallen from the skies.

(From *Achat*, Vol. 1, No. 10)

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New Books

FORAMINIFERA — by Joseph A. Cushman. 1948. 4th Edition. 605 pp., 86 pls., 9 fig., $10.00. To this work on the forams, first published in 1928, Dr. Cushman brings the greatest wealth of experience in micropaleontology. An indication of the outstanding quality of the book is indicated by the fact that of all the genera listed only five per cent have not been personally observed by the author. The classification of these protozoa represents the best picture of their relations now available.

Not only the professional but also the amateur micropaleontologist will find Dr. Cushman's study of value. The first 64 pages include such interesting topics as: description of living animals and their skeletons; methods of collecting, preparing and studying forams; procedures for study in economic investigations; and geographic and geologic distributions.

The classification of the foraminifera requires 373 pages, being divided into 50 families and their genera. In addition to the adequate description of each genera the geologic range of each is given, making possible the use of the various genera as index fossiles. Another outstanding feature of the book is the inclusion of an excellent bibliography which is subdivided to include sections on geographical and geological distribution, on classification and general information, and on bibliographies.

Of considerable value is the last section of the book which is devoted to an excellently illustrated key to the identification of first the families of forams and then their genera. The book will be a welcome addition to the paleontologist's shelf. Harvard University Press, Cambridge, Mass.

—C. W. W.

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GEOLOGY AND MAN—by Kenneth K. Landes and Russell C. Hussey. 1948. 518 pp., 189 illustrations, $6.45. "The utilitarian value of geology has been amply demonstrated," says the authors of GEOLOGY AND MAN. "The challenge that now faces the science is that of obtaining equal success in demonstrating its cultural values."

The title of this new book is indeed appropriate. Dr. Landes, Professor and Chairman, Department of Geology, University of Michigan, who wrote the chapters on physical geology constantly reminds the reader of the relationship of man's activities and welfare to geologic events, past and present. The chapters devoted to the practical applications of geology describe the search for mineral deposits and the work of the geologist in engineering projects such as dams, tunnels, and reservoir sites. Professor Hussey, also of the University of Michigan, wrote the chapters on the fascinating history of life on the earth, including the geologic history of man.

The book is designed for a one-term course which may be both a beginning and a terminal course in geology, and as such it is an excellent book for the young student and layman who wish to obtain a rather complete work on earth science in one volume.

Accompanying the text are a large number of photographs of unusually good quality as well as a series of excellent drawings of crustal features and early life forms by John Jesse Hayes.

In spite of its rather high price, this book should command a rather large following. Prentice-Hall, Inc., New York, N. Y.

PHYSICAL GEOLOGY AND MAN—by Kenneth K. Landes. 1948. 414 pp., 165 illustrations, $6.00. This is the same as Geology and Man, reviewed

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above, but lacks the four chapters on Historical Geology by Hussey. It is designed especially for use during the first term of a two-term course in physical and historical geology. Prentice-Hall, Inc., New York, N. Y.

IRON RESOURCES OF CALIFORNIA — Prepared under the direction of Olaf P. Jenkins. 1948. 304 pp., 25 pls., 68 figs., $2.50. "This bulletin contains sixteen individual articles contributed by various authorities on the geology and iron-ore resources of the state. . . Never before has such a complete bulletin been issued covering all of the known iron-ore deposits of importance in California."

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ENTWICKLUNG DER MINERALOGISCHEN UND GEOLOGISCHEN ERDKENNTNIS IM 19. JAHRHUNDERT (Development of Mineralogical and Geological Earth Knowledge in the 19th Century) — by Hans Schneiderhohn. 1948. 21 pp., $0.50. An interesting account of the development of the geological sciences in Europe during the 19th Century, this booklet was written by the Director of the Mineralogical Institute of the University of Freiburg I. Br. It is concerned chiefly with the work of Werner and Goethe. A short bibliography of other works relating to this topic is included. Accompanying this study is "Die Monatsteine", a poem written by Theodor Korner in 1810, based on an Arabian myth. Achat-Verlag, Hamburg, Germany.

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Science Service

The search for uranium is being pressed in the land of Arkaroo, the giant serpent. Mount Painter, in the Australian state of South Australia, is the site of the renewed atomic prospecting.

Four hundred miles north of Adelaide, the mountain is in the remote Flinders Ranges. Nearby in the Gammon Ranges is the mythical home of the serpent, invented by the natives to account for strange rumblings in the earth. Geologists have identified the rumblings as subterranean rock movements. But the scientists have made a discovery much more important thant the myth of Arkaroo.

Radioactive ores exist over a 100-square-mile area in the region of Mount Painter. This was first found several decades ago when radium was discovered. A small quantity of radium was obtained, but the radioactive ores of the region were largely neglected until 1944 when the Allies were secretly searching for sources of uranium.

An airstrip and road were built, but other sources of uranium elsewhere in the world were more promising, so development of Mount Painter again lagged near the end of World War II.

Now, a new program of exploration is under way, sponsored by the state government, to determine the quality and extent of the ores. If it is successful, Ankaroo's mythical home may be an important center in an atomic era.

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KANSAS MINERAL PRODUCTION FOR 1948 BREAKS ALL PREVIOUS RECORDS

The 1948 value of minerals produced in Kansas exceeded 400 million dollars, breaking all previous records, according to Earl K. Nixon of the State Geological Survey of Kansas.

"This is a preliminary estimate," Nixon said. "As finally computed the total value may reach 410 million dollars."

He pointed out that oil and gas account for the lion's share of this amazing mineral production, in which Kansas ranks fifth among the states, but that Kansas also is advancing rapidly as a producer of nonmetallics other than petroleum.

"The value of this expanding group of nonmetallics, among which clay products, stone, and sand and gravel are the leaders, amounted to more than 30 million dollars the past year," Nixon added. "Stone and clay products alone increased 33 percent in two years."

Final mineral production figures will be published by the U. S. Bureau of Mines in their Minerals Yearbook for 1948, to be issued at a later date. In another year, however, Nixon explained, under a new arrangement between the State Geological Survey and the Bureau of Mines, preliminary figures will be gathered and issued jointly soon after the close of each year.

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NEW CINEMATOME CAMERA-GRINDER MACHINE REVEALS PORISITY OF OIL-BEARING ROCK

TULSA, Okla., Dec. 22—A camera and a grinder with a diamond grinding wheel give promise of helping the oil industry study rock from deep under the surface of the earth to find answers to the problem of how to get more oil out of the ground.

The combination is called a cinematome machine. With it, motion picture "tours" through the insides of the rock are taken. The rocks examined are samples of cores brought to the surface from drill holes. The pictures show their porosity. The grinder can cut slices of rock so thin that it would take 30 of them to be as thick as a newspaper page.

Most oil deposits are found in porous rock formation thousands of feed underground. But the oil can be produced only if there are enough tiny holes in the rocks, connected so that oil droplets may move through to the well bore. This device is adding to scientists' knowledge of rock and how oil moves through porous formation. It is expected to aid in the development of better ways of increasing oil-flow to the wells.

The cinematome is a development here of Stanolind Oil and Gas Company by Henry Schaefer of the company's production research department. The feeding of the rock into the grinder is automatic. With the help of an electric motor, the rock layer shaved away passes from the grinder into place in front of the camera. When its picture is taken on a motion picture film, it makes way for another sample.

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Letters To The Editor

Dear Sir:

I surely am enjoying each and every copy of The Earth Science Digest.

I think that the last copy I have received, which was the November issue, was the best one that you have published.

Sincerely,

PAUL BOHN
Shelbyville, Kentucky

Dear Mr. Eisenberg:–

Inclosed is $2.00 for my 1949 subscription to The Earth Science Digest. You are doing an excellent job with the new publication.

In the November issue of the Digest there appeared an article on the huge iron meteorite that was found in Millard County, Utah, in 1944. In this article it was stated that scientists of the Smithsonian Institute were puzzled by the fact that the large meteorite was found lying on top of the ground instead of being buried and that it showed no marks of any kind on its surface due to its impact with the earth. Their explanation of these facts was that it fell either in "deep snow or loose sand" or that it "fell some distance from the point where it was found and either bounced or rolled to the place where it finally came to rest."

I visited the site where the meteorite was found two or three days after it had been shipped to the Smithsonian. I also visited the site many times the following five or six weeks for the University of Utah to make a survey of the location to see if the land on which the metorite was found was State land on Government land. The law governing the ownership of a

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meteorite is that the meteorite belongs to the land on which it naturally comes to rest. Whoever owns the land owns the meteorite. If the land was owned by the State of Utah, a demand would have been made on the Smithsonian Institution to return the meteorite to Utah. Unfortunately for us, the ground on which the meteorite was found was Federal land, so the government - owned Smithsonian has the specimen.

The meteorite came to rest on the crest of a very low hill where the bed rock extends for rods in all directions and is but scantily covered with soil. The dirt where the meteorite lay was about three inches deep. I am personally convinced that the meteorite came to the earth at an extremely low angle and when it struck it bounced and rolled some distance before it came to rest, and of course, remained on top of the ground. It could not have landed in "deep snow" as this desert country is rarely ever covered by more than a very few inches of snow. And the only sand in the neighborhood is confined to the bottom of a few dry washes or a little in the depressions between th hills.

The statement that the specimen was unmarked by its impact with the earth is explained by the fact that the meteorite is composed of nickel-iron and this alloy is the toughest metal ever found in nature. This iron mass of 1164 pounds striking the ground in the section of Millard County where it was found would not even be scratched, as none of the rock formations there are very hard. . . .

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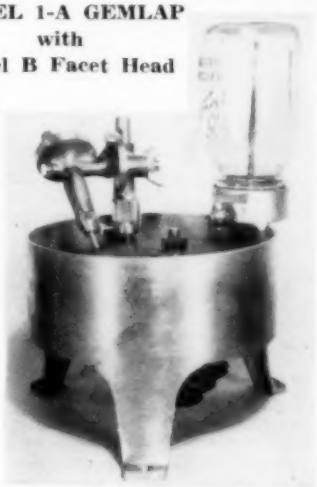

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